Phoenix Sky Harbor International Airport

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Aviation Supplement to City of Phoenix Information Technology Standards

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1.0 Introduction to Standards

The City of Phoenix Telecommunications Cabling System Standard is the main telecommunications standards document. These standards are consistent with the current City of Phoenix (COP) standards and include enhancements in collaboration with the COP Information Technology Department (ITD).

The intent of this document is to serve as the Aviation Department's supplement to the City of Phoenix Telecommunications Cabling System Standards document for the Aviation Department, detailing the set of standards specific to the business needs of the Aviation Department and the airport campus. The Aviation supplement and the City Standard will ensure that airport specific design and installation of all telecommunications cabling infrastructure requirements will be met. Both standards address end-user needs, current industry safety standards, technical and performance specifications, warranty requirements for all systems and equipment, as well as meet the needs of the Aviation Department while adhering to the City's Standards.

1.2 Overview

1.2.1 As this is a supplement only the sub-sections that differ and that are Aviation Department specific from the City standards are included in this document. The City Standard must be referenced for all other section standards. Chapter 1 is an overview of this document. Chapters 2 through 6 cover the five segments of the telecommunications distribution system. These chapters describe the "Design Process," including the main topics and components that must be considered when planning and designing a particular segment of the system. Chapter 7 describes the Cable Management System (CMS) and Network Management System (NMS): the system used to administer the passive infrastructure and the requirements needed to be accounted for to coordinate with this system. Chapters 8 and 9 cover the quality assurance requirements for the design/installation and systems warranty respectively.

1.2.2 The section and subsection numbering within this document closely corresponds to the numbering schema of the City Standards for ease of use in referencing between the two documents. Where additional subsections not

covered in the City Standard are introduced in this document, the section numbers begin where the City's section or subsection numbers end.

1.2.3 Refer to Appendix A of the City Standards for a list of the recognized industry standards and guidelines for telecommunications systems.

2.0 Main Cross-Connect (MC)

2.1 Description

2.1.1 Additionally, at the Airport, any combination of the following may be housed in the MC as required on a location specific basis: tenant equipment, CLEC equipment, Passenger Information and Paging System (PIPS), Access Control and Monitoring System (ACAMS) components, fire alarm connectivity, HVAC control equipment, Passenger Emergency Duress System (PEDS), CCTV, as well as future technology systems.

2.2 Design Requirements

2.2.4 Doors shall be on ACAMS and a card reader shall be provided on both the inside and outside of the room as the badge swipe process will need to be performed for both ingress and egress. Provision for emergency exiting of the room shall be made available. In the event of power outage, the Aviation Department would require that the door be designed to a no lock status.

2.2.5 Door signage consistent with the Aviation Department's practices shall be installed indicating the room number only.

2.2.16 The MC shall be equipped with a minimum of two dedicated 208V AC 30 ampere rated electrical outlets mounted in the bottom of the vertical cable management section on separate branch circuits. The requirement for the dedicated 208V 30 amp circuit is only for the powering of stand alone UPSs that feed network equipment. For MCs equipped with a whole room high capacity UPS, a 20 Amp circuit is required at the bottom of the vertical cable management for all networking equipment. Power for subsidiary systems is to be determined by vendor specifications. Outlets are to be located between active equipment racks within the CPI cable management system 12" AFF.

2.2.20 These rooms should be on separate fire protection loops and a gaseous fire protection system such as FM-200 or Inergen should be used. However, to

meet City of Phoenix requirements for MCs, a pre-action “dry” pipe sprinkler system is required.

2.2.22 CAD work performed as part of the design effort shall also meet the requirements of the Aviation Department’s Cable Management System.

2.2.23 One monitored fixed CCTV camera shall be located on the inside and one on the outside of the MC. Both shall be located to clearly monitor the door of the MC.

2.3 The Location of the MC

2.3.1 There shall be one MC per terminal or major building.

2.3.3 For existing structures, all water pipes transiting the room shall be removed or contained. For new construction all piping shall be designed to not enter the room.

2.4 The Size of the MC

2.4.5 At a minimum the MC shall be 15’ x 20’ to accommodate all technology equipment to be housed in the room with provision for future growth.

2.7 Cable Pathways Entering the MC

2.7.3 Sleeves and slots shall be positioned 6 inches from their center to the wall on which the cables are to be supported. An Arizona state approved professional engineer shall approve all structural changes and floor penetrations. Contractor shall acquire approval from the City to position slots and sleeves beyond 6 inches from the wall.

3.0 Telecommunications Closet (TC)

3.1 Description

3.1.1 Additionally, at the Airport, any combination of the following may be housed in the TC as required on a location specific basis: CLEC equipment, Passenger Information and Paging System (PIPS), Access Control and Monitoring System (ACAMS) components, fire alarm connectivity, HVAC control equipment, Passenger Emergency Duress System (PEDS), CCTV, as well as future technology systems.

3.2 Design Requirements

3.2.4 Doors shall be on ACAMS and a card reader shall be provided on both the inside and outside of the room as the badge swipe process will need to be performed for both ingress and egress. Provision for emergency exiting of the room shall be made available. In the event of power outage Aviation would require that the door be designed to a no lock status.

3.2.10 The room temperature shall be maintained between 64°F and 75°F, with a relative humidity between 30% and 55%.

3.2.15 The TC shall be equipped with a minimum of two dedicated 208V AC 30 ampere rated electrical outlets on separate branch circuits for network equipment. Power for subsidiary systems is to be determined by vendor specifications. Outlets are to be located between active equipment racks within the CPI cable management system 12" AFF.

3.2.19 These rooms shall be configured with a pre-action, dry pipe fire protection system.

3.2.21 CAD work performed as part of the design effort shall also meet the requirements of the Aviation Department's Cable Management System.

3.2.22 Connection to the TC shall be via two 4'x4'x12" pullboxes which are located on adjacent walls from each other. Each pullbox will have 2-4" conduits extending into the TC. All connectivity to the TC will be via the pullbox with 1" conduits where the cabling will be extended into the TC using the existing 2-4" conduits.

3.2.23 Door signage consistent with the Aviation Department's practices shall be installed indicating the room number only.

3.3 The Location of the TC

3.3.3 For existing structures, all water pipes transiting the room shall be removed or contained. For new construction all piping shall be designed to not enter the room.

3.4 The Size of the TC

3.4.4 At a minimum the TC shall be 12'x15'.

3.5 Termination Hardware Requirements

3.5.1 Patch Panels for Copper Horizontal Cabling

a. UTP cables supporting data Jacks shall be terminated on Ortronics® Clarity[6] T568B 24- or 48-port, High Density, Category 6 patch panels.

3.5.2 Data Patch Panels. UTP patch panels that provide Data service to Jacks shall be installed using the following preferred and recommended products.

a. Ortronics® Standard Density, TracJack Patch Panels with Clarity[6] TracJacks. Part number OR-401045290 (24 port).

b. Ortronics® Standard Density, TracJack Patch Panels with Clarity[6] TracJacks. Part number OR-401045292 (48 port).

c. The patch panel shall support RJ-45 modules wired to the TIA/EIA 568-B standard on the front, and have 110-style IDC connectors on the back.

d. The patch panel shall provide front and rear designation strips for labeling, to include above the RJ45 module.

3.5.3 Data Patch Cords.

c. Manufactured patch cords shall be installed to meet the minimum bending radius of 0.25 inches as specified in ANSI/TIA/EIA 568-B.1-AD-1, Sub clause Addendum 10.2.1.3.

4.0 Horizontal Cabling

4.1 Design Process

4.1.3 CAD work performed as part of the design effort shall also meet the requirements of the Aviation Department's Cable Management System.

4.4 Cable Types and Lengths

4.4.1 The City recognizes two types of cables for use in the horizontal segment: UTP (unshielded twisted pair) and 50 micron multimode fiber optic cable.

a. UTP cable will be 4-pair, 24 AWG, solid conductor cabling that meets ANSI/TIA/EIA 568-B.1 and B.2 cabling specifications for Category 6 cable, to include any/all Amendments and Bulletins, and must meet specified specifications and performance requirements. Performance testing shall be conducted at the component level by a UL certified testing

laboratory, and include Active Live Channel Testing to insure manufacture and performance quality. LANmark-1000 manufactured by Berk-Tek®.

4.5 Termination Hardware Requirements at the Outlet

4.5.1 Terminate each UTP cable as specified in section 4.2 The Type and Number of Jacks.

4.5.3 Each UTP cable for voice or data applications will be terminated at the outlet with a Cat 6, RJ-45 Module, 8P8C, T568B, 180° degree exit, Module Information Outlet. Any colors not specified in this document will need final approval/coordination from the City. Ortronics parts and part numbers shown below.

OR-TJ600

TracJack Module

4.8 Cable Testing Procedures

4.8.3 UTP Horizontal Cable Testing

a. City requires that all UTP cable pairs be Permanent Link tested with a Level IIE or Level III tester for full compliance with TIA/EIA 568-B.1 and B.2, Category 6 specifications regardless of intended use.

b. Test results shall be in City approved Aviation Cable Management System worksheet.

d. Reference Table 4-1 for testing parameters.

Table 4-1 Permanent Link Testing

Parameter	Category 6
Specified Frequency Range	100MHz
Pair to Pair NEXT	41.8 dB

Parameter	Category 6
Power Sum NEXT	39.3 dB
Insertion Loss	18.6 dB
Pair to Pair ELFEXT	24.2 dB
Power Sum ELFEXT	21.2 dB
Return Loss	14.0 dB
Propagation Delay	498ns @ 10MHz
Delay Skew	44ns
Wire Map	TIA/568B.2
Length	≤ 295 feet

4.9 Fire Alarm System

4.9.1 The Aviation Fire Alarm System utilizes the PDS infrastructure for connectivity between Fire Alarm Control Panels (FACP). This connectivity shall be achieved by connecting each FACP to the closest PDS TC using 50 micron multi-mode fiber cable routed within a 1" conduit.

4.9.2 Coordination between the contractor and Aviation Technology shall be performed for fiber optic cross-connectivity within the PDS TCs.

4.9.3 All Fire Alarm Hub rooms are connected to the closest PDS TC via an existing 4" conduit. This allows for airport wide interconnectivity.

4.10 CCTV

4.10.1 The Aviation CCTV System utilizes the PDS Infrastructure for connectivity between the head-end equipment and end devices. This connectivity shall be achieved by connecting each camera to the closest PDS TC using 50 micron multi-mode fiber cable routed within a 1" conduit.

4.10.2 Coordination between the contractor and Aviation Technology shall be performed for fiber optic cross-connectivity within the PDS TCs.

4.10.3 All CCTV Hub rooms are connected to the closest PDS TC via an existing 4" conduit. This allows for airport wide interconnectivity.

4.11 Access Control (ACAMS)

4.11.1 The Aviation ACAM System utilizes the PDS Infrastructure for connectivity between the head-end equipment and end devices. This connectivity shall be

achieved by connecting each end device to the closest PDS TC using 50 micron multi-mode fiber cable routed within a 1" conduit.

4.11.2 Coordination between the contractor and Aviation Technology shall be performed for fiber optic cross-connectivity within the PDS TCs.

4.12 Passenger Emergency Duress System (PEDS)

4.12.1 The Aviation Passenger Emergency Duress System utilizes the PDS Infrastructure for connectivity between the head-end equipment and the PEDS camera. The voice connectivity required for the PEDS station shall be achieved by connecting the PEDS device to the closest PDS TC using 1-Cat 6 unshielded twisted pair cable routed within a 1" conduit. The camera fiber optic cable and the voice copper cable shall be routed together within the same 1" conduit to the PDS TC.

4.12.2 Coordination between the contractor and Aviation Technology shall be performed for fiber optic cross-connectivity within the PDS TCs.

4.12.3 All CCTV Hub rooms are connected to the closest PDS TC via an existing 4" conduit. This allows for airport wide interconnectivity.

4.13 Passenger Information Paging System (PIPS)

4.13.1 The Aviation Passenger Information and Paging System utilizes the PDS Infrastructure for connectivity between the PIPS server equipment and the end devices.

4.13.2 The Passenger Information and Paging System (PIPS) communicates with the City Owned Multi-User Flight Information Display System (MUFIDS) and the Work Station (WS) for data entry, Baggage Information Display System (BIDS), Paging Assistance Location (PAL) and Visual Paging (VP) Displays, and Message Initiation Stations (MIS) for Gate Paging.

a. The Multi-User Flight Information System (MUFIDS) and Work Stations (WS) requires one (1) CAT6 cable for each Digital Direct Controller (DDC) computer that controls one (1) MUFIDS display. The CAT6 cables shall be routed together within the same conduit sized for the entire MUFID bank to the existing pullbox located adjacent to the closest TC.

b. The Baggage Information System (BIDS) requires one (1) CAT6 cable for each Digital Direct Controller (DDC) computer that controls one (1) BIDS

display. The CAT6 cables shall be routed together within the same conduit sized for the entire MUFID bank to the existing pullbox located adjacent to the closest TC.

c. The Paging Assistance Location (PAL) requires two (2) CAT6 cables, one for each Digital Direct Controller (DDC) computer that controls the two (2) Visual Paging (VP) displays on the PAL. The PAL also requires one (1) CAT6 cable for voice needed as an audio ring down circuit to the Comm. Center. The CAT6 cables shall be routed together within a 1" conduit to the existing pullbox located adjacent to the closest TC.

d. The Message Initiation Stations (MIS) for Gate Paging requires one (1) CAT6 cable for each Digital Direct Controller (DDC) computer that controls the MIS DDC computer. The CAT6 cable shall be routed together within a 1" conduit to the existing pullbox located adjacent to the closest TC.

4.13.3 Coordination between the contractor and Aviation Technology shall be required for all required connectivity within the TCs.

4.14 Parking Control System (acronym?)

4.15 put verbiage saying that the PDS will need to be used for all future systems.

5.0 Riser Segment

5.1 The Design Process

5.1.3 CAD work performed as part of the design effort shall also meet the requirements of the Airport's Cable Management System.

5.2 The Size, Type and Termination of Fiber Optic Riser Cable

5.3.2 Each MC to TC fiber cable routed to each TC shall be comprised of 24 strands of multimode and 48 strands of singlemode fiber strands in separate sheaths.

5.3.4 The type of riser cable shall meet the following requirement. Of these two conduits the first conduit shall contain 2-3 cell geotextile innerduct, or City approved equivalent, and the remaining two shall remain empty.

6.0 The Campus/Metropolitan Area Network (MAN) Segment

6.1 Design Process

6.1.3 CAD work performed as part of the design effort shall also meet the requirements of the Airport's Cable Management System.

6.1.4 Use of FAA ductbanks for underground routing may be an option through the Airport's Joint Use Agreement with the FAA. Note that Aviation utilizes mesh textile innerduct while the FAA currently utilizes smooth walled plastic innerduct.

8.0 Quality Assurance

8.1 Quality Assurance Overview

8.1.1 This chapter addresses requirements for the Quality Assurance for all aspects of the PDS design and installation.

8.1.2 Contractor Qualifications:

a. Only City QVL approved qualified installers shall be used to perform any installation or services.

b. Must be certified to install and warranty the Berk-Tek / Ortronics NetClear® Structured Cabling System.

c. Must be supervised on-site by a BICSI RCDD. Must demonstrate knowledge and compliance with all BICSI, TIA/EIA, UL, and NEC standards and codes.

d. Contractor shall have the required number of certified installers as mandated by the manufacturer as having completed the necessary training to complete the installation. Resumes of the certified members on the team shall be provided along with documentation of completed training courses.

8.1.3 Refer to Section 4.8 Cable Testing Procedures for the testing requirements of Riser Cabling and Horizontal Cabling.

9.0 Systems Warranty

9.1 Systems Warranty Overview

9.1.1 This chapter addresses the requirements for obtaining the required warranty coverage for the PDS upon installation completion.

9.1.2 The cabling installation shall be installed such that it qualifies for the Berk-Tek/Ortronics (manufacturer) NetClear® 25-Year System Installation warranty. A NetClear Structured Cabling System means a System properly constructed with NetClear approved Berk-Tek/Ortronics products in accordance with referenced standards; meeting specified link/channel performance and topological (distance and connection) limits. This includes all Manufacturers products that are installed in conjunction with approved NetClear solutions. Performance guarantees apply only to installed channels utilizing appropriate Ortronics patch cords manufactured from Berk-Tek cordage. Any warranty repairs, replacements, moves, additions or changes shall be warranted for the balance of this warranty period.

9.1.3 NetClear® Warranty shall commence the date of installation registration which shall coincide with installation completion.

9.1.4 The NetClear Warranty shall ensure that the installation:

a. will be free from Bit errors caused by the NetClear structured cabling system components.

b. will meet or exceed applicable ratified TIA/EIA and ISO/IEC transmission performance standards in force at the time of installation for a Structured Cabling Link/Channel;

c. will support any current or future application which is designed for transmission over a Structured Cabling System as defined by the above referenced standards and the NetClear Data Sheet in effect at the time of installation.

d. will conform to the transmission performance specifications of the NetClear Data Sheet in effect at the time of installation; and

e. will be free from defects in material and workmanship on the products installed.

9.1.5 Warranty Conditions for this warranty to be valid:

a. The System components having never been used before;

b. The Patch Cords must be manufactured by Ortronics

c. The System must have been installed by a Certified Integrator/Installer authorized by the Manufacturer in accordance with the Manufacturer's installation specifications, the requirements of the above mentioned technical standards, and the terms and conditions specified in the Berk-Tek and Ortronics Certified Integrator/Installer Program agreement;

d. All installation records must be updated to reflect any maintenance, movements, additions or changes, etc. Manufacturer will not be responsible for moves, additions or changes performed by parties other than a Certified Integrator/Installer; and

e. All warranty claims must be made to the original Certified Integrator/Installer, or the local Manufacturer representative, within 5 days of discovery of the alleged defect in the System products.

Appendix A – Reference Materials

Following is a list of reference material on telecommunications infrastructure:

- City Of Phoenix Information Technology Department – Telecommunications Cabling Systems Standard – 11/2001